SCIENCE

NEW SERIES
VOL. L, NO. 1281

FRIDAY, JULY 18, 1919

SINGLE COPIES, 15 CTS.
ANNUAL SUBSCRIPTION, $5.00

SCIENCE

FRIDAY, JULY 18, 1919

CONTENTS

Democratic Coordination of Scientific Efforts: DR. H. H. WHETZEL 51

On Duty Free Importation: C. H. ASH 55

The Division of Engineering, National Research Council: GALEN H. CLEVENGER 58

Scientific Events:—

The Watt Centenary; The Shortage of Coal in Europe; The Proposed Medical Foundation for New York City; The Philadelphia Meeting of the American Chemical Society. 60

Scientific Notes and News 62

University and Educational News 65

Discussion and Correspondence:—

The History of Science and the American Association for the Advancement of Science: FREDERICK E. BRASCH. *The Needs of Paleobotany:* DR. G. R. WIELAND. *Gravitational Attraction and Uranium Lead:* ANDERS BULL. *Working up in a Swing:* DRS. V. KARAPETOFF, PAUL E. KLOPSTEG 66

Scientific Books:—

Kinnicutt on Sewage Disposal: DR. GEORGE W. FULLER 71

Special Articles:—

The Possible Presence of Coronium in Helium from Natural Gas: DR. HAMILTON P. CADY AND HOWARD MCKEE ELSEY 71

The Iowa Academy of Science: DR. JAMES H. LEES 72

MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

DEMOCRATIC COORDINATION OF SCIENTIFIC EFFORTS[1]

COOPERATION and coordination are the very essence of all evolution and progress, biological, social, political, moral, industrial or what not. We acknowledge without controversy the fundamental rôle of these factors in the evolution of living things. They constitute the woof and warp of the social fabric, without them political machinery can not function, and the wheels of industry cease to turn; they condition every ethical and moral principle. It is the glory of science that it has uncovered and made clear this fundamental fact of organic evolution. But in the organization of its own activities how little has it profited by its own discovery. The Honorable Elihu Root has well said:[2]

> Science, like charity, should begin at home, and has done so very imperfectly. Science has been arranging, classifying, methodizing, simplifying everything except itself. It has made possible the tremendous modern development of the power of organization which has so multiplied the effective power of human effort as to make the difference from the past seem to be of kind rather than of degree. It has organized itself very imperfectly. Scientific men are only recently realizing that the principles which apply to success on a large scale in transportation and manufacture and general staff work apply to them; that the difference between a mob and an army does not depend upon occupation or purpose but upon human nature; that the effective power of a great number of scientific men may be increased by organization just as the effective power of a great number of laborers may be increased by military discipline.

It may well seem strange to the layman that

[1] Presented in the symposium on "Our present duty as botanists" before the joint session of the Botanical Society of America and the American Phytopathological Society, December 26, 1918, at Baltimore, Md.

[2] SCIENCE, N. S., 48, 532–534, 1918.

scientists have not applied to their own profession the doctrine of cooperation and coordination so vigorously and successfully preached to others. Yet the fact remains that while the rest of mankind has gone far along the way which we have discovered and pointed out we still remain largely isolated and intrenched in the feudal towers of our individualism. Here behind moat and wall we shape and fashion those intellectual darts with which at our annual tourneys we hope to pierce the haughty pride of some brother baron. Yet common sense, the common-good, the very progress of our profession demands that we abandon this ancient outworn attitude.

For more than four years now we have been witnessing one of the greatest convulsions in the inexorable march of human evolution. Again the intrenched autocracy of individualism has gone down before the invincible march of democratic socialism and we look with longing expectation for the consummation of that age old dream, a true league of mankind, free from the blighting menace of individual selfishness.

How then shall scientific men, who often and in so many ways have pointed out the path along which mankind shall realize its vision of common brotherhood, perfect in their own relations the doctrine which they have so persistently and effectively taught. How shall we truly cooperate and effectively coordinate our efforts and discoveries. While I must admit the obstacles and the difficulties which confront us, frankly I see none that are fundamental or insurmountable. They are in nowise of a different sort or more formidable than those which confront other men. Every honest scientist must admit the desirability, yes the very necessity of scientific cooperation, if we are to maintain that lofty position of disinterested leadership in the economic affair of mankind which we so long have held to be our natural heritage.

But one short year ago this body of men acknowledged this grave necessity by their common effort to organize themselves for more effective participation in the gigantic struggle then at its zenith.

What then are some of the specific difficulties with which we are confronted. One says, "This is my idea, how shall I be protected in my possession and exploitation of it" and he hoists aloft the bugbear of priority, at once the reward and the curse of scientific work. "What," cries another, "shall I share my immature conclusions with my intellectual inferiors," and then proceeds to contribute another half-baked fragment to the crumbs that litter scientific publication. Is any truly scientific man so poor in ideas that he can not afford, forsooth, the loss of a crumb or two if that the common good be better served by the free and open display of his wares? I have been ever free to expose my own discoveries and ideas on scientific matters for the consideration and criticism of my colleagues nor am I aware that any of them has ever been intentionally filched or appropriated. It may well be of course that all of them have been like the contents of the proverbial purse. No man shall thus greatly lose, for by the very display itself he most protects that which is truly his; for who will steal cakes from the common table and hope to get away with it? Another invokes the shades of a jealous director to justify his selfish doubts of the possibility of cooperative action. Well, have we not ever boasted of our academic freedom, and if we choose to pool our ideas shall autocratic administrators rise to say us nay? Real administrators most recognize the value and advantages of cooperation and will be the first to approve our efforts in this direction. The common good alone deserves consideration. Will any one gainsay the fact that more than half the words with which we dress our darlings for the press are so much padding old and soiled with wear? How immature and verdant too, too many of them are. Then why not bring them forth in all their nakedness and let the eyes of all the tribe appraise them at their worth, discuss them, test them, fit them in their proper place and stamp with general approval that which posterity may use with confidence and gratitude. Think of the weary hours we now must give to burrowing in literature. Then shall we not forswear our

selfishness and join to make an end of a condition unscientific and unsound?

"It can't be done!" It has been done, is being done to some degree right now among us. And you will pardon me, I trust, if I bring forward in proof of this assertion a piece of cooperative research in my own field. Under the auspices of the War Emergency Board of American Plant Pathologists, workers in fifteen states and in the federal department have planned and carried out cooperatively a most extensive investigation on cereal seed treatment with the result that in one year we have approached general agreement upon a single simple safe and most effective method, of wide application, for the control of externally-borne, seed infesting cereal smuts. I need not dwell upon the advantages thereby accruing to science and to practical agriculture.

Once more I beg your indulgence. In a single conference of two days duration the potato disease pathologists of the continent in August, 1918, in free and open exchange of facts and ideas made more progress toward the solution of the difficult problems of leaf roll and mosaic, than would have been accomplished in five years of individual reflection in solitary confinement.

It is evident, of course, that cooperation and coordination of our scientific activities can not be accomplished without organization. The character of this organization is a most vital consideration. It can not be imposed upon us, it must be of our own making. It must be truly democratic and without autocratic possibilities. Moreover, it must directly affect only those individuals who of their own free choice are willing to associate themselves together to this end, nor shall any one be excluded who is prepared to enter this association with zeal and unselfish purpose. But organization alone, no matter how democratic, can not succeed without good leadership; leadership of the highest order, strong, vigorous, of broad vision, wholly devoted to the common good, above reproach. We must demand that the ablest shall lead and we must give them our fullest confidence, our heartiest allegiance and our unqualified support in the undertakings.

Having now set forth what I believe to be the most fundamental factors for success in cooperative undertakings in scientific work, I may be expected to present something concrete respecting the *modus operandi* by which we may hope to realize this success. In presenting for your consideration the following plan I am not without experimental data upon which to base my opinion that it will be found exceedingly workable. It is essentially the method by which the American plant pathologists have, during the past year, sought to speed up accomplishment within their own field. The results have been so remarkable, so indicative of what cooperative effort may be expected to accomplish, and the methods by which this has been effected, so generally approved amongst us, that I venture to predict that the machinery which we have evolved will, in its essentials, best serve to promote in other fields of science the true spirit of cooperation and coordination. The thing about which all cooperative effort in science must center is the solution of some definite problem, be it one of research, of teaching or of extension. For the solution of this problem a number of workers voluntarily agree to associate themselves. The ideal condition is that in which all workers in any way interested in the problem become co-partners in the attack upon it. Not only that but there must be a general understanding that any person who in the future becomes interested may, without hesitation, claim the privilege of associating himself in the undertaking. In short those uniting for the conduct of a given project, constitute the *project committee*. Each project committee selects from among their number some one to be their leader, note I say leader, for only under real leadership can the work be carried to a successful consummation. If the committee finds that it has been mistaken in its choice the evident and democratic expectation is that it will promptly choose another to lead. Just what is expected of the committee chief is clearly implied in the word *leader* and I therefore need not dwell upon

his qualifications or his duties. It should be clear, however, that neither planning of the project, nor partitioning of the field nor assignment of work is to be a function of the leader or of any group within or without the committee. Each individual must be free to undertake that which his inclination and his facilities dictate. Nor shall any one reserve to himself alone any phase of the problem whatsoever. Each must feel free to duplicate, to test or to try the work of the other. The solution of the problem is the thing and personal aggrandizement at the expense of one's colleagues must give place to personal service and its more lasting rewards, for I am convinced that there will be more of glory and renown for each participant in a cooperative accomplishment, complete and well rounded, than in the best fragment which any of them alone might pass down to posterity.

You will next demand to know how effective cooperation and coordination within the committee is to be assured without personal contact and exchange of view. I reply, it is not. This brings us to a consideration of the *project conference.* A conference of at least a considerable majority of those proposing to associate themselves together in the work will be requisite for the very organization thereof; and the selection of a leader will be by no means the only business. At the initial conference there must be the freest and fullest exchange of data already in the hands of each member, of all the ideas, yea, of all the "hunches" which each may have upon the subject. Every man's cards, all of them, must be upon the table, faces up. They must in the very beginning pool, in the fullest sense of that word, their combined resources and then there must be an exhaustive examination and discussion of every item presented, with finally a summarized inventory of their stock in hand. With this before them, plans for future work will be agreed upon and each will return to his post to carry forward to the best of his ability that portion of the work which he himself has chosen to do, feeling that he has a vital part in a vital problem worthy of his best endeavors. Nor will he be tempted to dissipate his time and energy on other phases of the problem which he feels are necessary compliments to that upon which he desires to concentrate his efforts. He will know that another seeks their solution and will bring them eventually for fitting together with the parts which he himself has shaped.

Succeeding conferences on the project must be arranged. They should at least be annual for while much may be accomplished by correspondence it is only in the heat of personal discussion that the various parts can be effectively welded into a coordinate whole.

There is much virtue in conferences of real cooperators. They are not the "talk-fests" and sparring matches of competing individualists. They are the business meetings of an open corporation. They are not for the reading of preliminary papers, they are for the making of comprehensive contributions. They require days not hours. Two solid days including the intervening evening were required to organize the project work on potato mosaic, leaf roll and seed certification in the Buffalo conference of potato disease pathologists last August; and no time was wasted. These conferences must be arranged for and the cooperators must be gotten to them. The necessary traveling funds must be found.

And now I hear some skeptic mutter to his neighbor, "But how about publication." The answer is simple. A group of men who will cooperate in the solution of a scientific problem will also cooperate in the publication of their work. That too is their problem, and different groups will solve it differently.

It is apparent that some organization or association of the units, the project committees, is not only desirable but perhaps imperative. They need the stimulus that comes through association; each needs to coordinate its own problem with the related ones. This has been accomplished to some extent by the phytopathologists in the formation of general project committees consisting of the leaders of the committees on closely related projects, as for example the general potato disease project committee, of which Dr. W. A. Orton is now leader.

Within each well-defined field of science, where cooperative projects of the kind I have indicated are in operation, there should be and naturally would be provided a general coordinating board of strong, aggressive but tactful leaders, small in numbers, but alert and far seeing, who would guide, not direct, the effective organization and development of the cooperative idea.

Such a board must be constituted through the free and well considered choice of a democratic electorate. I believe that the plan which will insure most satisfactory and effective results is the selection of a leader by vote of all the cooperating workers in the field. The leader to select, subject to their approval the remaining members of the board. The size of the board, tenure of office and other details of a like nature are of relatively little importance so long as they remain subject to the control of a live democracy.

To hold that such a program as I have here outlined can be carried through easily and without difficulties would be to acknowledge ignorance of human nature. The selfishness of individuals has always been the chief obstacle to cooperative undertakings and selfish ambition is not uncommon among scientific men. Yet the measure of the success of true democracy will always be the extent to which this human weakness is suppressed and eliminated. Cooperation among scientists for the solution of problems must come. In no other way shall we be able to rise to the demands and the opportunities of the age. The pioneer days of science are largely over and progress is to be made only by organized and united effort. Why shall not the botanists of America lead? Already one group among us has indicated the possibilities in this direction. Botany in its broadest sense must justify itself in an economic world even as chemistry is doing and there is no want for opportunities. Colleagues shall we organize, shall we cooperate, shall we coordinate, and shall we show the way?

H. H. WHETZEL
CHAIRMAN OF THE WAR EMERGENCY BOARD
OF AMERICAN PLANT PATHOLOGISTS,
CORNELL UNIVERSITY

ON DUTY-FREE IMPORTATION

BEFORE the great war, the practise of importing duty free many things required by educational institutions had become so thoroughly established as to be regarded as part of the normal course of events. What had first been regarded as a special privilege came to be looked upon as a special right; and institutions, justly or unjustly, considered themselves entitled to purchase anything required for their maintenance in the lowest world market and to do this quite regardless of any conditions of high tariff or low tariff. Prohibitive tariff; protective tariff; tariff for revenue only had little or no interest for them. "Made in Germany," "Made in Japan," "Made in England," were more familiar inscriptions on laboratory apparatus than "Made in America."

In August, 1914, duty-free importation was stopped and now for the first time it is possible to resume it again. The question of whether or not it is desirable to do so is to the mind of the writer a pertinent one.

That it was the part of wisdom and good policy in the early days of our country when "higher education" was represented by a few denominational institutions, mainly supported by private contributions to grant them the privilege of importing without duty the instruments necessary for their research, is beyond question.

Science was practically unknown in this country; in fact, science as we know it to-day was almost unknown in the world. The amount of apparatus required by all the world was but a small fraction of that now utilized by America alone. An astronomical telescope, a compound microscope, a spectroscope was a rare instrument for which the world must be sought over, and having located an instrument of scientific interest, what more natural than that the pioneers of science in this country should be allowed to import it duty free? They were furthering the development of science and education and helping to create the demand that now exists for enormous quantities of such instruments, many of which have developed entirely out of the class of scientific

curiosities and experimental instruments and become everyday tools of trades and professions.

That it was the intention of the legislators to accomplish this very end is evident from the wording of the act granting the privilege. In enumerating the list of free goods it includes: (A) "Books, maps, music, engravings . . . publications (not including advertisements) for gratuitous circulation." (B) "Publications, *not more than two in any one invoice* in good faith for the use of any society or institution, incorporated solely for religious, philosophical, educational, scientific or literary purposes." (C) "Philosophical and scientific apparatus, utensils, instruments and preparations including boxes and bottles containing the same in good faith for the use and by the order of any society or institution" as above described "and not for sale."

These three provisions are incorporated in the same act and referred to in the same paragraph in 1918 annotated edition of Federal Laws. Does it not appear reasonable that if the original framers of these laws could have looked far enough into the future to see the enormous number of identical instruments now imported by single institutions for use in student laboratories, and thus virtually sold to the students in their payment of tuition and rents, even though the institution may retain its title to them till they are worn out, that they might have added the same provision in regard to instruments that was set down concerning books of learning, viz: "not more than two in any one invoice"?

It is of interest too to note the trend of opinion as to what was intended to be granted by this provision and what constitutes "philosophical instruments" by noting the interpretations that have been put on the question by the courts.

In 1890, one Oelschlaeger imported a consignment of mixed goods, all of which he claimed were to be classified as "philosophical instruments" and entitled to the special provisions and exemption due to goods so classified. Robertson, an official whose duty involved the appraising of goods and classifying them for rates of duty, declined to accept this classification and demanded the duty on them when classified as "mechanical instruments." Oelschlaeger brought suit for the recovery of duty so paid. The court found for the defendant in a portion of the goods and for the plaintiff in another portion. In handing down the decision, the following language was used:

> The most that can be done, therefore, is to distinguish between those implements that are used more especially in making observations, experiments and discoveries and those which are more especially used in the arts and professions. For example; an Astronomical Telescope, a Compound Microscope, a Ruhmkorf coil, would be readily classified as philosophical instruments or apparatus. While the instruments commonly used by surgeons, physicians and navigators for the purpose of carrying on their several professions and calling would be classified amongst mechanical implements, or instruments for practical use in the arts and professions. . . .

Continuing the quotation:

> It is somewhat difficult [said the Court] in practise to draw a line of distinction between the two classes in as much as many instruments originally used for the purpose of observation and experiment have since come to be used partially or wholly as implements in the arts.

Among the goods included in this particular consignment were a high-grade compound microscope, a small and simpler microscope for the examination of textiles and an ophthalmoscope. The former of these three instruments were held to be philosophical instruments, while the two latter were not deemed entitled to this classification.

In a similar case in 1885 in Manassee *vs.* Spalding, it was held that anemometers, hygrometers, Ruhmkorf coils, galvanometers, Geissler tubes, Granet batteries and radiometers were "philosophical apparatus," but that surveyors' compasses could not be so classified.

We fail to find any recent court decision in regard to the separation of instruments into philosophical apparatus and the implements required for pursuing a given trade or profession, but viewed in the light of the case just cited it seems to us not improbable that if the court were called on now to render a

decision distinguishing philosophical instruments from working tools, that many instruments now classed as "philosophical" would be found to have progressed into the class of instruments for practical use.

It is reasonable to consider not only the intention of the law originally passed and its subsequent interpretation by the courts, but to ask ourselves the question, what policy at the present time is just and what would most tend to the development of scientific research? Let us grant, if you wish, that educational institutions whether private, semi-private, as those partially supported by private contributions, and partially by taxation, or entirely public as our great state universities, are entitled to subsidy from the federal government. Is such subsidy best granted by exempting them from paying duty on certain classes of goods and not on others?

Let us consider for example a great university in process of building. For its halls it will require a large amount of window glass; for its chemical laboratories it will require glass beakers, flasks, etc. Both are essential, both are made in America and both are protected by duty, but the university enjoys especial exemption from paying duty on one and not the other.

We deem it not just to thus discriminate against the manufacture of the glass that happens to be used for scientific purposes.

Not justice alone, but also expediency must be considered in determining a national policy, for manifestly the apparent rights of one individual or firm should not be allowed to prevail in opposition to the general good. We, therefore, consider lastly the question, Is it expedient in case of tariff resumption to exempt schools and colleges?

Education in this country is no longer an "infant industry." There were listed in Patterson's Educational Directory for 1916 approximately 700 colleges and universities, embracing 144 technical schools, 31 schools of mines, 137 schools of agriculture, 20 schools of forestry, 128 schools of medicine, 60 schools of dentistry, 31 schools of metallurgy, 91 schools of pharmacy and 27 schools of veterinary medicine. These do not include normal schools and "teachers' colleges" of which there are about 450, to say nothing of the enormous number of public and private secondary schools, schools of domestic science and others requiring varying amounts of "scientific and philosophical" apparatus. Who can estimate the extent of the requirements of these institutions for apparatus and materials more or less properly classified as "scientific"? They are certainly of sufficient magnitude to be worthy of the best brains and best energy America can produce. By the policy of duty-free importation such brains and such energy will be diverted to channels yielding greater immediate financial returns.

Furthermore, research and investigation, while interesting, to be of benefit to humanity must be developed to practical ends. The application of scientific research to all the arts and industries was never so prevalent or necessary as at the present time. Scientific apparatus is now as necessary to the development of many of our important industries as to the training of men to do the work. These industries constitute a further demand for scientific and technical instruments that is sufficient to aid greatly in supporting American manufacturers of such goods, and we believe that in the long run the cause of education can best be served by permitting educational institutions to aid in the developing of these industries under a policy of protection commensurate with that accorded the production of other necessities for the comfort, prosperity and progress of the great mass of American people.

It is true that at the present time certain instruments, notable among which are spectrometers, polarimeters, refractometers, etc., necessary or desirable for the advancement of science, are not manufactured in this country, and it is also true that under present industrial conditions their manufacture can not be begun in competition with European instruments imported duty free; but we believe, furthermore, that it is true that their manufacture once begun American competition would develop American efficiency, and that in a short time our institutions would be better served by Americans than they have been in the past by Europeans.

It appears to us that the duty-free privilege has, in a measure at least, defeated its own end in depriving the American manufacturer of means necessary to put the time, thought and experiment into high-grade scientific instruments which is requisite for real progress, leaving us dependent on foreigners for such investigations and the advancement incident thereto. If a few have apparently been able to make a notable exception of their products, this has been accomplished only by placing on a purely commercial basis an industry which ought to be, in fact, must be, for long-continued success based on the firm foundation of scientific research. The impossibility of properly conducting such research has often reduced us to the status of imitators dependent for our own progress upon investigations conducted on the other side of the ocean.

If it has been imposible, under existing conditions, to manufacture or properly develop instruments already known, what can be expected in the way of new instruments to accomplish new purposes. Increasing and expanding research calls for new and modified instruments and, *vice versa,* new instruments uncover new lines of research. In other words, the two go hand in hand. The retarding of one retards the other, and the stimulation of one stimulates and helps the other.

What is true in regard to science in the abstract is equally true in regard to men doing scientific work. The development of the manufacture of scientific instruments under a protective policy will thus react favorably on the educational institutions themselves by building up a demand for their graduates.

It is manifestly absurd to endeavor to discriminate between a policy beneficial to educational institutions and one desirable for the people as a whole. Our educational system from the kindergarten to the university is our very life blood; we can not promote the institution to the detriment of the people, nor can we favor other interests at the expense of the institution.

The great bulk of education in our country is supported, as it should be, by taxation. Is it best to contribute to their support by the kind of subsidy that grants them special privileges in regard to certain classes of goods, at the same time making them dependent on foreign manufacturers; or by the very slightly increased taxation necessary to develop American independence in scientific instruments as in other lines of industry?

C. H. Ash

Buffalo, N. Y.,

THE DIVISION OF ENGINEERING NATIONAL RESEARCH COUNCIL[1]

The War Organization of the Engineering Division comprised four sections; a section on metallurgy, a section on mechanical engineering, a section on electrical engineering, and a section on prime movers. The work of each section was under a chairman, who was directly responsible to the chairman of the division.

The section on metallurgy had for its principal work the solving of metallurgical problems arising in connection with the conduct of the war, more particularly those brought to it by the military. This work was accomplished through the medium of committees, whose personnel included leading authorities upon metallurgy.

The section of mechanical engineering established a drafting room in charge of a chief draftsman at research council headquarters and through the generosity of the Carnegie Institute of Technology a machine shop at Pittsburgh under the direction of a foreman. These were used for the development of inventions referred to the section by the physics and engineering divisions.

The section on electrical engineering concentrated its efforts upon the problem of electric welding, more particularly electric welding as applied to ship building. This section worked in very close cooperation with the Emergency Fleet Corporation, who financed its investigative work.

The section on prime movers devoted its attention chiefly to the design and development of power plants for aircraft.

[1] Address given at joint session of the National Academy of Sciences with National Research Council, April 30, 1919, Smithsonian Institution, Washington, D. C.

The efforts of each section were so directed as to be of the greatest service in the solving of the problems of greatest immediate need to winning the war; each has to its credit important achievements during the war period.[2]

Reorganization of the engineering division on a peace basis has now been fully accomplished. The division consists of three representatives of each of the four founder engineering societies. The societies so represented being the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Institute of Mining Engineers, and the American Society of Civil Engineers; further there is one representative each from the four more important non-founder societies. The societies so represented being the American Society for Testing Materials, the American Society of Illuminating Engineers, the Western Society of Engineers, and the Society of Automotive Engineers. In addition to the representatives of the engineering societies there are twelve members at large, making a total membership in the division of twenty-eight. The paid officers of the division are a chairman and a vice-chairman.

The work of the engineering division has gone steadily forward during the reorganization period and to such an extent that the newly organized division is now performing all its functions and begins its career, *a going concern.*

A plan of close affiliation of the division with the engineering foundation has recently been approved by the members of the foundation and the executive board of the National Research Council. By the terms of this agreement the engineering foundation will provide the engineering division an office in the Engineering Societies Building at New York, together with most of the necessary clerical force; further they will make appropriations from time to time of their funds to aid specific undertakings of the division. The location of the engineering division at this center of engineering activity and the close affiliation with the engineering foundation will be important contributing factors to the future development of the division.

At present the division is working largely through the medium of committees. It is common knowledge that it is easy to form committees, but difficult to get them to function properly. Very careful consideration has been given the problem of organizing the research committees of the engineering division. We have found that given an energetic chairman, who is master of his subject and who inspires confidence, an active group within the comittee to perform the necessary researches, a still wider group who may not have time to devote to research but who through breadth of experience are particularly well qualified to act in an advisory capacity, and last but not least the necessary funds, and important results are sure to follow.

Time will not permit of going into the work of the committees in detail. The work so far undertaken covers the fields of metallurgy, electrical engineering, mechanical engineering and to a less extent civil engineering.

The engineering division now has some fourteen committees at work upon various problems. At present fourteen states, extending from the Atlantic to the Pacific are represented and the number is rapidly increasing. Men connected with educational institutions, the military and civilian bureaus of the government and large manufacturing concerns are willing and even eager to serve upon these committees; in fact appointment to one of them is regarded as an honor.

The principal work of the engineering division is to stimulate and coordinate research. It is not to be regarded as an instrument of research, but rather as a stimulator and director of other instrumentalities of research which are brought together through the medium of committees. In suggesting, planning, and organizing researches which other agencies carry out, it performs a valuable and unique service. It arouses interest where it did not previously exist, brings together agencies none of which for various reasons were able to do the whole of a research,

[2] See Report of the Academy of Sciences for the Year 1918.

but which are able and willing to contribute an important part of a research.

Galen H. Clevenger,
Acting Chairman of the Division of Engineering

SCIENTIFIC EVENTS

THE WATT CENTENARY[1]

Additional interest has been given to the forthcoming commemoration of the centenary of the death of James Watt by the movement just inaugurated in Glasgow to found locally a James Watt chair of engineering at the university. Birmingham engineers decided some time ago that a similarly named chair should be installed in the university of their city, besides holding a centenary commemoration and erecting an international memorial to the three great pioneers, Watt, Boulton and Murdock. The commemoration in Birmingham will be held on September 16–18. London, Glasgow, and Greenock, and, indeed, all parts of the country, are heartily cooperating, and, with few exceptions, the universities and scientific societies, together with many manufacturers and individual eminent men, are associating themselves with the scheme. In the Science Museum at South Kensington steps are being taken to arrange a comprehensive exhibition of Watt relics. In Birmingham the Watt relics existing there, which have so carefully been preserved by the forethought of Mr. George Tangye, and were a few years back presented to the city, will be completely rearranged and displayed with many additions. Two pumping-engines made by Boulton and Watt will be seen; one, the first sold by the makers in 1776. will be actually shown under steam, and raising water. A memorial service will be held in the Parish Church at Handsworth, where the three contemporaries are buried. A garden-party will be held in park at Heathfield Hall, where the garret workshop still remains as Watt left it. Lectures will be delivered by eminent men and a centenary dinner held. Some doubt seems to have been raised with regard to the claims of Birmingham to an international memorial. It should be remembered, however, that Watt's association with Boulton led to the success of his engine. Boulton's factory was famous for workmanship throughout Europe. It is true that Watt conceived his first ideas whilst working at the University in Glasgow, but he gained no practical success until he went to Birmingham. He spent the best part of his life there, including the evening of his days after he retired from business. The foundations he laid by scientific thought and careful study have resulted in the great and universal application of steam, and the appeal comes appropriately from Birmingham for an international memorial to him.

[1] From *Nature*.

THE SHORTAGE OF COAL IN EUROPE

The Bureau of Mines gives figures showing that western and southern Europe is badly in need of coal. The deficiencies in the several countries were supplied by Great Britain, which now faces a loss of its export business through reduction in its coal production. On a pre-war basis of consumption the following tabular statement gives the deficiency in the various countries in western and northern Europe which must be met by imports:

	Long Tons (2,240 lbs.)
France	20,000,000
Spain	3,650,000
Italy	9,650,000
Holland (other than supplies from Germany)	2,010,000
Sweden	4,560,000
Portugal	1,360,000
Norway	2,300,000
Mediterranean countries (other than Italy)	3,500,000
Denmark	3,030,000
Total	50,060,000

In 1913 Great Britain supplied 31,000,000 tons to north Europe; 32,000,000 tons to France, and south Europe, that is 63,000,000 tons to the above-named countries, and others, in Europe, in addition to which about 9,000,000 tons was sent to South America; and 5,000,000 tons to other parts of the world.

If the statements made before the Parliamentary Commission are correct, from the

most favorable point of view, as estimated by Sir Richard Redmayne, conditioned on maintaining of war-time restrictions on domestic consumption, Great Britain will be able to supply only 23,000,000 tons for export during the coming year, dating from July 16. If, on the other hand, the domestic consumption was on a pre-war basis, there would be but 7 million tons available. But, on the basis of Sir Reymayne's figures, if all the coal were shipped to western and southern Europe, there would be a deficiency of over 25,000,000 tons without considering the 14,000,000 tons that Great Britain, in 1913, supplied for other parts of the world. There is thus a total deficit of approximately 40,000,000 tons, which if it is to be supplied at all, can be supplied by America only, on the assumption that Westphalia and Belgium are unable to materially increase production for several years. At best there is evidently a very large amount of coal that the United States could and should supply to relieve the situation in Europe and in South America, now that there is likely to be enough shipping flying the American flag to take care of the business.

THE PROPOSED MEDICAL FOUNDATION FOR NEW YORK CITY

ANNOUNCEMENT has been made by Dr. Royal S. Copeland, health commissioner of New York City, of an organization to be known as the New York Association for the Advancement of Medical Education and Medical Science.

The association's constitution and by-laws have already been adopted and an application has been filed at the Secretary of State's office in Albany for a charter. Dr. Wendell C. Phillips, ear specialist and general surgeon for Bellevue Hospital, is the president, and Dr. Haven Emerson, formerly health commissioner of New York, is the secretary.

Dr. Phillips, who is the originator of the project, planned before the war for an institution that would at least rival Vienna and Berlin. The world conflict postponed the matter, but as soon as the armistice was signed the physician and those interested with him revived the plan. A meeting was held on April 10, at which prominent medical men gave their views, and a committee was appointed to deal with the matter.

As stated in the constitution of the association, there are four primary objects to be attained. There are: First: To improve and amplify the methods of graduate and undergraduate teaching. Second: To perfect plans for utilizing the vast clinical material of the city for teaching purposes and to make use of teaching talent now unemployed. Third: To bring about a working affiliation of the medical schools, hospitals and laboratories, as well as the public health facilities of the city, to the end that the best interests of medical education may be conserved. Fourth: To initiate the establishment of a medical foundation in New York City whereby funds may be secured to meet the financial requirements of all forms of medical education and investigation.

There will be two classes of membership in the organization, one a general membership, including all physicians in good standing, teachers of auxiliary sciences, and investigators of problems relating to medicine; the other, a corporate membership of medical teachers and medical men with hospital appointments or affiliations. The corporate membership is limited by the constitution to not over 150.

The physicians who are responsible for the plan issued a short statement, which was given out at the board of health offices, in which they said:

> For years it has been evident that medical education, both undergraduate and graduate in New York has not adequately represented the possibilities of this great city. One of the reasons for this state of affairs has been the lack of financial support for our medical institutions. A more potent reason, however, arises from the fact that individual institutions working along somewhat narrow lines have accomplished satisfactory general results. The larger possibilities which could only come from a more or less central organization have failed to materialize.
>
> As a result, men seeking medical education have been obliged to seek medical centers in European countries where more individual and special courses could be secured with but little trouble.

It is a historical fact that after every great war, the medical center of the world is changed and the war just over will be no exception to the rule. In line with these ideas and in order to give New York City this opportunity to at least become one of the leading teaching medical centers of the world, our organization has been formed.

In addition to Dr. Phillips and Dr. Emerson, the following compose the officers of the association: Dr. George D. Stewart, president of the New York Academy of Medicine, first vice-president; Dr. Glentworth Butler, chief medical consultant of the Long Island College Hospital, second vice-president; Dr. Arthur F. Chace, stomach specialist of the Post-Graduate Hospital, treasurer. The trustees are Colonel Charles H. Peck, Dr. William Francis Campbell, Dr. John E. Hartwell, Dr. Frederick Tilney, Dr. Otto V. Huffman, Dr. Adrian Lambert, Dr. Samuel A. Brown, Dr. James Alexander Miller, and Dr. George W. Kosmak.

THE PHILADELPHIA MEETING OF THE AMERICAN CHEMICAL SOCIETY

Owing to the great advances made by American chemistry as a result of the European war, the fifty-eighth meeting of the American Chemical Society to be held in Philadelphia from September 2 to 6 inclusive will be undoubtedly the largest ever held by that organization.

The membership which has increased nearly twofold since 1914 is now 13,600 and is being augmented every month. The sessions which are to be held at the Bellevue-Stratford will touch upon problems of reconstruction growing out of developments which place the American chemist so much on his own resources both for materials and apparatus with the closing of foreign markets.

One of the features of the meeting will be the first session of the newly organized dye section. There will be a joint session of this section with the Division of Industrial Chemists and Industrial Engineers to consider a proposal to revise the patent laws. It has been suggested the charging of nominal annual renewal fee would compel many patentees to work their patents, rather than to permit them to be idle for many years.

Special arrangements have been made to give to all delegates access to the chemical plants of Philadelphia. There will also be an excursion on the Delaware River which will give them the opportunity of viewing the munition works erected in that region. The conversion of such establishments to the ways of peaceful industry will come up in various aspects before divisions of the society.

The provisional program is as follows: September 3, council meeting and dinner to council tendered by the Philadelphia Section; September 3, general meeting, with addresses by Newton B. Baker and other distinguished speakers; followed by divisional meetings; September 4, divisional meetings and president's address, by Dr. William H. Nichols, at the Museum of the University of Pennsylvania. September 5, divisional meetings and banquet in the evening at Bellevue-Stratford, the program to conclude on the sixth with excursions and automobile trip to Valley Forge.

The Philadelphia Section urges that members write now for hotel accommodations.

SCIENTIFIC NOTES AND NEWS

Dr. Abraham Jacobi, the distinguished physician and author, professor emeritus of diseases of children in Columbia University, died on July 11, in his eighty-ninth year.

Professor Albert A. Michelson, head of the department of physics at the University of Chicago, has been appointed to the rank of commander, U.S.N.R.F. He served as lieutenant commander in the Bureau of Ordnance of the Navy Department at Washington during the war.

The Royal Geographical Society has conferred its patron's medal on Professor William Morris Davis for eminence in the development of physical geography.

Professor H. Gideon Wells, of the department of pathology of the University of Chicago, has been decorated with "the Star of Roumania" by the King in recognition of his work as head of the American Red Cross Mission to Roumania.

AT the May meeting of the American Academy of Arts and Sciences, Professors Joseph Lipka, G. A. Miller, F. R. Moulton and Virgil Snyder were elected fellows in the Section of Mathematics and Astronomy.

THE University of Aberdeen has conferred the honorary degree of LL.D. upon Emeritus Professor Cash, recently retired from the chair of materia medica in the university, and on Emeritus Professor Japp, who retired from the chair of chemistry five years ago.

VILHJALMUR STEFANSSON, the Arctic explorer, has been awarded the La Roquette gold medal of the Geographical Society of Paris. The award is in recognition of discoveries made by the Canadian Arctic expedition, commanded by Mr. Stefansson during the years 1913–18.

MAJOR-GENERAL WILLIAM C. GORGAS, formerly Surgeon-General of the United States Army, and, after his retirement, director of the yellow fever work of the International Health Board, has returned from a trip to South America in an endeavor to determine the seed beds of yellow fever, and institute systematic measures to destroy the disease at its source.

PROFESSOR WILLIAM ALANSON BRYAN, of the College of Hawaii, left Honolulu recently for a two years' tour of the South Pacific Islands to collect zoological data which might throw light on the history of the great continental land mass supposed to have existed there in past ages. Professor Bryan is an authority on mollusca and will devote most of his energies to collecting land shells.

DR. FRANK E. BLAISDELL, SR., of Stanford University, and Mr. E. P. Van Duzee, curator of the entomological department of the California Academy of Sciences, will spend their summer vocation, studying the entomological fauna of the Lake Huntington region, Fresno county, California, at an elevation of 7,000 feet.

DR. LYNDS JONES, head of the department of animal ecology, at Oberlin College, left on June 20 with a party of 22 for an ecological expedition to the Pacific coast. The party will return to Oberlin on September 1.

DEAN HARRY HAYWARD, who served as director of the college of agriculture in the A. E. F. University at Beaune, France, has returned to the United States and has assumed his duties as dean and director of the agricultural department of Delaware College.

DR. JOHN K. KNOX (Chicago, 1917), formerly geologist on the Canadian Geological Survey and later for some years on the staff of the Roxana Petroleum Company, has been appointed assistant state geologist of Kansas. He will have special charge of the oil and gas investigations of the survey. Several parties are now engaged in field work.

DR. E. A. BAUMGARTNER has resigned as associate in anatomy in the Washington University medical school, St. Louis, and accepted a position with Dr. A. E. Hertzler at the Halstead Hospital, Halstead, Kansas.

THE General Bakelite Co. has provided the funds for an industrial fellowship in the department of chemical engineering of Columbia University. This fellowship differs from the general type of industrial fellowships in that in addition to the amounts paid to the fellow and for the chemicals and apparatus used by the fellow, an additional sum is paid to the university to compensate it for the use of the laboratories and other facilities used by the worker. A further difference is that no time or other limitation is put upon the publication of the results of the investigation. Mr. Mortimer Harvey has been appointed to the General Bakelite Co. fellowship for 1919–20.

MR. GEORGE BARSKY has been appointed to the Bridgham fellowship ($1,500) at Columbia University for the year 1919–20. He will work in the department of chemical engineering with Professor McKee on the utilization of the waste liquor from sulphite pulp mills. Mr. Barsky received the degree of chemical engineer in 1918 from Columbia University.

MR. HENRY M. MELONEY, of Bordertown, N. J., who was graduated from the New York State College of Forestry, at Syracuse University, with the degree of B.S., in June, 1919, has just accepted appointment to a technical fellowship for the study of forestry, lumber-

ing and paper and pulp manufacture in Sweden under the American-Scandinavian Foundation. Ten college and university men from America will be sent to the Scandinavian states under the American-Scandinavian Foundation for study and research. Two of these fellowships are in forestry and the others in mining, electrical engineering, etc. The fellowships carry $1,000 and are of one year's duration.

Professor Robert Andrews Millikan, of the department of physics of the University of Chicago, and recently vice-chairman of the National Research Council in Washington, will lecture before the summer session of the university on July 25 on "The New Opportunity in Science."

We learn from *Nature* that an additional meeting of the Royal Astronomical Society was planned for July 11, to receive American astronomers who are on their way to Brussels to take part in the conference of the International Research Council, which will be opened there on July 18. The party is expected to include Professors Campbell, Eichelberger, Mitchell, Schlesinger, Stebbins, Adams and Boss.

The *Jahresbericht der Deutschen Mathematikir-Vereinigung,* as we learn from the *American Mathematical Monthly,* reports the deaths of the following mathematicians: Professor A. Benteli, of the University of Bern, on November 10, 1917, in his seventieth year. Professor E. Ott, of the University of Bern, on November 17, 1917, in his seventieth year. Dr. Robert Jentzch, of the University of Berlin, on March 21, 1918, fallen in battle. Professor M. B. Weinstein, of Berlin, in his sixty-fifth year. Professor G. Veronese, of the University of Padua, on July 17, 1917, in his sixty-third year. François Daniëls, of Nymwegen, Holland, professor of mathematics at the University of Fribourg, Switzerland, died on November 16, 1918, at the age of fifty-eight years.

In accordance with the trust founded by Mrs. Eliza Streatfeild for the promotion of research in medicine and surgery, a committee of the Royal College of Physicians of London and of the Royal College of Surgeons of England is proceeding to appoint a Streatfeild research scholar. The emolument will probably be £250 per annum, and the tenure of the scholarship three years at the discretion of the committee. Applications, which should state the nature of the proposed research, the place where it will be carried out, and the status of the applicant, should be addressed to the Registrar, Royal College of Physicians, Pall Mall East, S.W.1, and marked "Streatfeild Scholarship."

An inter-Allied Conference of Associations of Pure and Applied Chemistry was held in Paris on April 14 and 15. The conference has laid the foundation for an inter-Allied Chemical Association, to replace the International Association of pre-war times. Details of their decisions have not been made public. The program, however, is said to meet with the unanimous approval of all the delegates. Among the 350 guests present at the banquet were Lord Moulton; Sir William Pope, president of the British Federal Council; Professor Henry Louis, who was head of the British delegates, Mr. Henry Wigglesworth, the chief American delegate; Professor Chavanne, president of the Chemical Society of Belgium; Professor Paterno, vice-president of the Italian Senate; Professor Moureu, M. Paul Kessner, and M. Poulenc, presidents of the three principal French associations of applied and pure chemistry, and many other well-known men in the chemical and industrial world.

Besides supplying an important war need, according to the London *Times,* Sheffield has laid the foundation of a future industry by the progress made at the university in the manufacture of glass for laboratory purposes. In the summer of 1914 there was no manufacturer of laboratory glass in Britain. The whole process, the knowledge of which had been built up in Germany during the last half century, had to be discovered and workers specially trained. Laboratory glass was urgently needed in the manufacture of certain munitions and important and urgently required equipment would have been held up if it had not been supplied.

Nature says: "The facts made known by Lord Gainford and Lord Harcourt in the House of Lords on February 26 show that a long time must elapse before our museums and the staff of the Board of Education can resume their work unhindered. The latter body is scattered throughout London, while its records are stored in the galleries of the Victoria and Albert Museum. Half that museum is closed to the public, its circulation department shut down, its textile classes and other aids to industry suspended. The priceless Wallace collections are still in underground tubes. The National Portrait Gallery, the London Museum, the Tate Gallery and the British Musuem galleries of prints and of Egyptian and Assyrian antiquities, as well as much of its storage space, are occupied by huge clerical staffs. Finally, the exhibition gallaries of the Imperial Institute continue to be filled with a succession of other departments; the institute's lectures and demonstrations are in abeyance and its own research work is hampered because the raw materials are stored elsewhere. The result is not only to disappoint the American and Dominion troops, and to deny the British taxpayer the enjoyment of his great educational establishments; it is, above all, a serious check on the commercial and industrial development of the country. Unavoidable the delay may be, yet we can not help feeling that the situation would not have arisen had ministers a truer appreciation of the work done by and in our public museums."

UNIVERSITY AND EDUCATIONAL NEWS

THE gift of a chemical laboratory to Cornell University has already been announced. In a recent address President Schurman quoted the words of the anonymous donor: "I will provide you with a chemical laboratory, fully adequate to the needs of the university, and one that will in all respects and size be the best there is in America." It is said that the laboratory may cost $1,500,000 and that the new building will be placed where President Schurman's house now stands.

PRINCETON UNIVERSITY receives $50,000 by the will of the late Arthur Pemberton Sturges, and $10,000 by the will of the late Samuel K. Martin.

PROFESSOR DEXTER S. KIMBALL has been elected chairman of the faculty committee on organization of the College of Engineering of Cornell University, which will combine the two existing colleges. He was also elected dean of the new college upon its organization in 1921, when Dean Haskell and Dean Smith will retire by reason of having attained the age of sixty-five years.

ASSISTANT PROFESSOR W. S. FOSTER, of the department of psychology, of Cornell University, goes to the university of Minnesota as full professor.

DR. ARTHUR W. HIXSON has been appointed associate professor of chemical engineering at Columbia University. Professor Hixson was formerly associate professor of industrial chemistry and metallurgy at the University of Iowa, but for the last year he has been in the Ordnance Department at Washington, Dr. J. J. Morgan, assistant professor of chemistry at Stevens Institute of Technology, Hoboken, N. J., has been appointed assistant professor of chemical engineering.

AT Lehigh University Ralph J. Fogg, a member of the civil engineering department for eleven years, has been appointed professor of civil engineering and head of the department, and Dr. Fred V. Larkin, for the past four years assistant superintendent of the Harrisburg Pipe and Pipe Bending Company, has been appointed professor of mechanical engineering and head of the department.

AT Rutgers College P. H. Van der Menlen, Ph.D., has been appointed assistant professor of chemistry; Geo. W. Martin, M.A., assistant professor of botany; Thurlow C. Nelson, Ph.D., assistant professor of zoology, and T. Alan Devan, M.D., professor of hygiene and sanitary science.

LIEUTENANT-COLONEL FRANK D. ADAMS has returned from Europe for the purpose of as-

suming the position of acting principal of McGill University.

At McGill University Captain S. E. Whitnall, demonstrator of human anatomy, Oxford, has been appointed professor of anatomy, and John Tait, lecturer in experimental physiology in the University of Edinburgh, professor of physiology.

DISCUSSION AND CORRESPONDENCE

THE HISTORY OF SCIENCE AND THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

To the Editor of Science: From the discussions taking place concerning the history of science, and from the opening up of other unexplored fields of thought and research, it is happily only too evident that this country is once more approaching peace conditions and looking forward to greater things—among them, a fundamental position in education and science.

The letters in Science, April 4, by Dr. Felix Neumann, and May 9 by Dr. George A. Miller, have simply expressed a phase of the current of thought passing through our revision of ideas concerning the importance of science, study and research—all tending to a broader cultured type of scientific learning. It is not so much as emphasizing a national characteristic in the great international unification of learning, but as developing a new epoch in the history of science itself. In the words of Dr. George Sarton—we must try to reconcile idealism and knowledge, science and art, truth and beauty—the ability of every one to do so is the real measure of his education. In the last analysis it is the message of the New Humanism.

For this reason, if for no other, the study of the history of Science is to be encouraged, and no greater impetus can be given to it than by a full recognition of this new Section "K" by the American Association for the Advancement of Science.

This matter was broached during 1915 in an article in Science[1] which resulted in a number of letters giving encouragement, but like all such advancing ideals, not pertaining to the war, it made no progress.

The writer wrote to Dr. J. McKeen Cattell, editor of Science, concerning this proposed Section in the American Association for the Advancement of Science and in reply the following statement was received.

> I should think that there would be a good deal to be said for a section of the American Association for the Advancement of Science devoted to the history and methods of science. It might be best to begin with a sub-section under the section of anthropology and psychology, and it could be seen whether enough interest were taken to justify the establishment of a section. The best plan would doubtless be to correspond with those interested and then present a statement to the council of the association.

In another letter, quoting from Dr. Lynn Thorndike, Department of History, Western Reserve University, a proposition was advanced for the same purpose—namely, to call together a group of interested persons (no matter from what field of research) to discuss plans for an organization to be affiliated with the American Association for the Advancement of Science. Therefore, it might be said that the time is propitious for such an organization, especially as we will note further from other facts.

Dr. Neumann's plan for Section "K" would attract not alone scientists, but also historians of the social, economic and political science groups. Philosophers too, would no doubt be interested. This, then, would tend to make the American Association for the Advancement of Science an "encyclopedic" organization.

In Dr. Neumann's letter to Dr. Howard, he emphasizes the principle of "nationalism" by making the purpose of the section to the study of the history and progress of science in America alone. Much valuable work can be done here, to be sure, "but can we afford to neglect the centuries gone before?" Nor has Dr. Neumann mentioned what historical work has been done in the United States already. These attempts are worthy of mention, since they form a beginning and stepping stones as well as examples for other fields

[1] Science, N. S., Vol. XLI., No. 1053, March 5, 1915, pp. 358–360.

to follow. The pioneer work of George Brown Goode shows what is possible, brief as his studies were. The following titles will show the best that has as yet been accomplished, especially in the specific sciences.

In chemistry we have Dr. E. F. Smith, "Chemistry in America," and his "Life of Robert Hare"; G. P. Merrill's "Contribution of the History of American Geology," published by Smithsonian Institution, 1906, and Florian Cajori's "The Teaching of History of Mathematics in the United States," published by the U. S. Bureau of Education, 1890. Cajori's treatise is somewhat old, but still an excellent text, both in mathematics and astronomy for the period it covers.

In astronomy no definite history has yet been written. A number of addresses and papers have attempted to outline its history, and a number of biographical sketches give a good cross-section of a period. A history of astronomical progress in this country is urgently needed, since for the last decade we have attained the most prominent position, and the war will leave us undisturbed for generations to come.

Brief mention should be made of a very recent work entitled "A Century of Science in America, 1818–1919" by E. S. Dana. This, however, only covers the field of geology, mineralogy, physics and biology during this period.

A forecast of the possibilities of research and study, may be made by observing what has gone on before. In the matter of resources for research in the great libraries of the country, one library whose efforts have been fairly well directed towards this end is the John Crerar Library. The publications entitled "List of Books upon the History of Science and the History of Industry" serve as excellent bibliographical aid for the student in the history of science. For the study in the history of mathematics, undoubtedly Columbia University, under the leadership of Dr. E. D. Smith, offers good sources. In chemistry and physics, Pennsylvania, Yale and Harvard universities have excellent material. For astronomy, Harvard University library offers riches untold in the Colonial period, and Harvard Observatory for the material beginning in the early nineteenth century.

As a further indication of the times, our universities and colleges have recognized to an encouraging extent the great worth of courses pertaining to the development and evolution of the sciences.[2] The courses thus established are varied and numerous, as well as the methods of instruction and text used.

In view of what has been said concerning the subject of astronomy, it is interesting and worthy of note to call attention to the fact that courses in the history of astronomy in America have been established. Also within the last two years the University of California has established a chair devoted entirely to the history of mathematics.

Again attention should be drawn to the matter of text and treatise published in the country. Within the last two years there have appeared two books, "The History of Science," by Dr. W. Libby, and a second by Sedgwick and Tyler, entitled, "A Short History of Science."

We have also within our borders to-day the greatest authority in the field of history of science, Dr. George Sarton, of Ghent, Belgium. Dr. Sarton has lectured upon this subject in nearly all of the universities of the eastern and middle western states, and has been lecturer for two years in the department of History of Science at Harvard University, and is now research scholar in the Carnegie Institution.

We are well aware of a movement to establish in the United States an institute devoted entirely to the research and advancement of the history of science and civilization.[3] Also, recently we have been informed that *Isis*, the international journal of history of science[4] is to resume publication in all probability in this country.

[2] SCIENCE, N. S., Vol. XLII., No. 1091, November 26, 1915, pp. 746–760.

[3] SCIENCE, N. S., Vol. XLV., No. 1160, March 23, 1917, pp. 284–286. See also Vol. XLVI., No. 1191, October 26, 1917, pp. 299–402.

[4] SCIENCE, N. S., Vol. XLIX., No. 1259, February 14, 1919, pp. 170–171.

One of the great significant facts for the future to consider, and which will appeal to our patriotic spirit of attainment, is that the history of the great war must be written in terms of scientific discoveries and research. What part is the history of science to take in this achievement? What is the spirit of philosophy to bring forth from such a study? One fact is certain of emphasis, that the progress of science, national and international, must be cooperative. Not alone has the war taught us this, but the spirit of idealism, which we have fought to maintain, must be carried on.

All these facts are mentioned to show the spirit of the times, and now that this country has attained such a position of worth, the American Association for the Advancement of Science can give no greater encouragement to this idealism, to the philosophy of science, to the final meaning of education and culture, then by placing its approval upon the adoption of Section "K" to be known as the History of Science Section. Frederick E. Brasch

John Crerar Library,
Chicago

THE NEEDS OF PALEOBOTANY

What paleobotany most needs is men. The dearth of men conversant with fossil plants, not merely in America, but taking the world over, is to be deplored. Nathorst, the eminent Swedish paleobotanist, in a recent letter emphasizes this fact. Thin as it has been at all times, the paleobotanic rank and file has been all but decimated. The war seems to have hastened the end for three of the older men who adorned everything they touched—Zeiller and Lignier, of France, and Solms, of Strasburg. The career of the young and promising Fernan Pelourdé closed on the field of battle; and as heroic was the end for Ruth Holden in Russia. We lament too E. A. Newell-Arber, the course of whose life was also shortened by the war. To offset these great losses there have been no accessions abroad and the only younger worker who has definitely joined the paleobotanic ranks in this country during the past dozen years is Harvey Bassler. The American contributors in paleobotany, older and younger, are Hollick, Knowlton, David White, Jeffrey, Berry, and Sellards. All first came into notice twenty or more years ago, and both Sellards and White seem wholly lost to other interests, or to survey or executive duties.

Let any one think for himself what such a slender margin means to a great subject of growing and world-wide interest. What a lack there is of timely papers, of exploration in the field in a hundred horizons and a thousand important localities in both North and South America. Consider too, where the workers are so few and the field continent wide, what a lack of healthy criticism there must be. Without vigorous and knowing criticism small facts pass for great ones, and great principles and facts of far reaching import, whole categories of evidence, are left for long years unnoted. This is not the way to do the world's meed of work. Furthermore, progress in paleobotany peculiarly depends on the examination as far as practicable of the world's forests and fossils. Restriction is, more than in any other subject, fatal because of the exceedingly variable types of fossil plant conservation.

It is not within the present limits to go into any detailed account of the greater climatic and geologic problems, the solution of which awaits the work yet to come in the broader field of paleobotany. A suggestive account of the relations of paleobotany to botany was given by Professor Coulter in an address a few years ago.[1]

It is, however, well to recall several of the limits to the investigations of past floras as they stand to-day. Firstly, there can be no question that the indices of phytological form are many and valuable when properly combined. Yet not merely the paleobotanists, but the *botanists* have left the fine "nature prints" (better than the leaves themselves for comparison) just where the work of Ettingshausen closed about sixty years ago. And this, notwithstanding the fact that for years those

[1] Reprinted in *American Naturalist*, 1912, pp. 215–225.

engaged in broader forest study, especially in the tropics, have felt the severest need for ready or approximate identification by leaf characters. Secondly, an adequate study of fossil stems systematically collected, and including wherever possible to obtain, the circum-medullar region has never been even begun. Thirdly, the signal success with which Professor Nathorst has developed a chemical treatment of carbonized remains so that collodion imprints of many histologic features may be had, affords such an all-important factor of control that many of the longer known floras require restudy as a whole, or in part by this method. It is not probable that classification can be safely based on features disclosed by the "chemical method"; but as an aid in determining genera or species it is effective, often in the case of rather fragmentary material. Fourthly, the improved methods of sectioning coals, and fragmentary stems like those of the Kreischerville conifers, as developed by Jeffrey, indicate a great extension of exact study following more searching collection afield.

Under the circumstances we should have on at least ten of our surveys, and in at least a dozen of our larger universities thoroughly equipped paleobotanists. And need I call attention to the fact that the scientific requirements are severe? A good paleobotanist needs geologic and paleontologic, as well as botanic training, and above all things he needs to be not merely an expert in the laboratory but a rugged and determined field worker and collector. Such men have to be given position. Subsidiary activities, and foreshortened results, are apt to be near neighbors. Though the comparison be invidious, it yet requires to be made. In their larger collecting schemes both the invertebrate and vertebrate paleontologist constantly spend in collection and reconnaissance sums such as have never been even relatively available for work in the fossil plants not one whit less important.

In closing I would like to call attention to a point of concrete value. According to the interpretations of evidence which have thus far had acceptance, there results a lack of forest making types from the Trias to the close of the Jura. But if, as now seems apparent, the cycadeoids have a degree of angiospermous affinity, the microphyllous forms must often represent important elements in unrecognized forests. If so, many of the forms probably had the same capacity to thrive in temperate to colder climates as the dicotyls they often accompany, especially in the puzzling association noted by Hollick in the Kenai flora of Alaska.[2] This flora must have flourished near to snow fields and glaciers. The cold presaging the bipolar ice caps may therefore have come on far earlier than has been hitherto unquestioningly believed. This, with the new methods of study, and especially the more persistent scanning of the broader outlines of plant succession, is only one of the many problems which await development of paleobotany.

G. R. WIELAND

GRAVITATIONAL ATTRACTION AND URANIUM LEAD

TO THE EDITOR OF SCIENCE: As shown by Professor Theodore W. Richards in his presidential address,[1] it has been found that the last known disintegration product of the uranium series, uranium lead, behaves in all respects like ordinary lead, with the exception that it is slightly radioactive and has an atomic weight of about 206.1, as compared with that of ordinary lead, 207.2. It has also been found that lead derived from uranium minerals usually shows some value between the above limits and thus appears to be a mixture of the two former kinds. None of the many attempts made to effect a separation has, however, met with success, nor has any theory been advanced by which the discrepancies in atomic weight, which seem quite without a parallel among the other elements, may be satisfactorily explained.

The possibility suggests itself that the discrepancies referred to might be due to a slightly different behavior of the various forms

[1] "The Problem of Radioactive Lead," SCIENCE, January 3, 1919.

[2] See *American Journal of Science*, IV., 31, April, 1911, pp. 327–330.

of lead toward the force of gravitation. Whether or not this is so may easily be ascertained through physical tests which might preferably be in the nature of comparative pendulum measurements, lead derived from uranium ore being obtainable in sufficient quantities for the purpose.

The generally accepted law according to which the ratio of weight to mass has a fixed value in the same locality, irrespective of the nature of the substance, is largely empirical, as there are a number of elements for which the law has never been proved. Considering the very irregular distribution of other properties, like magnetism and radioactivity, among the elements it would not be surprising if deviations were found to exist in their gravitational properties as well.

From this point of view, *i. e.*, if deviations actually exist in the value of gravitational acceleration for the various forms of lead, the chances are that the value in any case will be proportional to the atomic weight, as in this instance the atomic mass, being the ratio of either, would come out the same for all forms of lead. Such a result would go far toward reconciling the discrepancies in atomic weight with already established theories, because what is really of interest, both from a physical and chemical standpoint, is not so much the weight of the atom as its mass. Weight is only an attribute of mass, the latter having long been recognized as the more basic entity.

The theories on gravitation are still in a crude shape, but if the attraction is assumed to be due to the movements of the electrons constituting the atoms a possible deviation in the gravitational attraction of uranium lead might perhaps be ascribed to a gradually subsiding state of tension or agitation among the electrons, caused by the splitting up of the atoms during the radioactive processes, conditions being thus comparable to those supposed to obtain in a permanently magnetized piece of steel. On this assumption uranium lead would, in course of time, increase in atomic weight, changing slowly into ordinary lead, while the lead derived from various uranium minerals might properly be considered as representing intermediate stages in this process of relaxation.

Anders Bull

Brooklyn, N. Y.

WORKING UP IN A SWING

To the Editor of Science: Mr. A. T. Jones has an article on this subject in the current volume of Science, p. 20, July 4, 1919. In the beginning he makes a statement as follows:

> As I do not recall ever seeing any discussion of this matter, the following note may not be out of place.

I wish to call Mr. Jones's attention to E. J. Routh's "Dynamics of a System of Rigid Bodies" (Macmillan), Vol. I., Art. 287, entitled "Examples of Living Beings." In example 6 he will find a complete solution of his problem, with the necessary mathematical equations.

V. Karapetoff

Cornell University,
July 8, 1919

To the Editor of Science: The letter in Science of July 4, by Professor Arthur Taber Jones, on "working up" in a swing, recalls to the writer that while studying the problem several years ago he found several references to the subject.

In the *Zeitschrift für physikalischen und chemischen Unterricht,* 16, 230 1913, H. Lohmann describes an apparatus by means of which the process of "working up" may be demonstrated. This consists of a plunger electromagnet, suspended as a pendulum, with its axis vertical. Raising and lowering the center of gravity of the suspended mass is accomplished by means of a key which controls the position of the plunger within the solenoid. The circuit is closed, and the plunger (and therefore the center of gravity) is raised when the key is in the "up" position; the plunger drops a short distance when the key is depressed. By imagining himself in a swing, the operator has no difficulty in so manipulating the key that the raising and lowering of the center of gravity of the swing-

ing mass are properly timed to bring about the increasing amplitudes.

The subject is treated analytically in the same journal by A. Hartwich, Vol. 17, 27, 1914. He arrives at an expression identical with that for Kepler's second law.

PAUL E. KLOPSTEG

PHILADELPHIA,
July 9, 1919

SCIENTIFIC BOOKS

Sewage Disposal. By LEONARD P. KINNICUTT, late Director Department of Chemistry, and Professor of Sanitary Chemistry in the Worcester Polytechnic Institute; C.-E. A. WINSLOW, Professor of Public Health in the Yale School of Medicine and Curator of Public Health in the American Museum of Natural History, New York, and R. WINTHROP PRATT, Consulting Engineer, M.Am. Soc.C.E. Second Edition, rewritten. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Ltd. Cloth; 6 x 9 in. Pp. 547. Illustrated. $4.00.

The first edition of this book which was reviewed by the writer in SCIENCE, February 10, 1911, Volume XXXIII., page 222, has been a successful reference book for students studying the fundamental principles of this branch of municipal sanitation. The present edition has been thoroughly revised and increased in size by about one hundred pages.

Progress has been rapid during recent years in this branch of the field of municipal sanitation. The revision of this book is timely as it is generally recognized that activities along this line, retarded by the world war, will shortly be taken up again with renewed vigor.

The style of the book is attractive and it is well arranged for use in the class room. Fundamental principles are clearly stated and use is made liberally of practical illustrations drawn from various important documents and investigations not only in this country, but abroad.

In bringing the book up to date, attention has been paid in particular to the activated sludge process, the two-story tank for the removal of suspended solids, with a comprehensive recital of advantages and disadvantages as now understood, and improvements in the fine screening of sewage, and progress in disposal of sewage sludge and the recovery of grease and fertilizing constituents from these waste products. Investigations conducted on a comprehensive scale at Cleveland, Chicago, Milwaukee and New Haven are described with summaries of results, as published. One of the merits of the book is that it is written from the viewpoints of the engineer, the chemist and the bacteriologist, thus bringing out for the consideration of the sanitarian and student the general principles of the subject from the angles stated, as is necessary in order to appreciate the practicability and efficiency of the respective methods.

The authors deserve commendation for their temperate statements on topics where current literature shows differences of opinion due presumably to variations in local conditions not as yet fully understood.

Little attempt has been made to set forth completely the most recent results obtained from the operation of plants most lately installed in this country. This may prove disappointing to some who devote themselves entirely to work in this particular field, but it is probably wise on the part of the authors to base a book for class room use on the broad historic background which as stated in the preface, forms the surest basis for real comprehension of the general principles of the subject as now understood. Teachers and students of this subject should welcome this new volume.

GEORGE W. FULLER

SPECIAL ARTICLES

THE POSSIBLE PRESENCE OF CORONIUM IN HELIUM FROM NATURAL GAS

ONE of us (Cady), with McFarland,[1] observed a number of lines in the spectra of samples of helium obtained from natural gas which did not belong in the spectra of helium,

[1] Kansas University Geological Survey, "The Composition of Natural Gas," p. 264.

[2] *Proc. Roy. Soc.*, 67, 467, 1901.

neon or hydrogen. These lines have been repeatedly observed in specimens of helium from that day to this. Living and Dewar[2] had observed some "wild" lines in specimens of Bath gas and suggested the possibility of the presence of coronium. In this connection it is interesting to note that some of the faint lines observed by us visually do correspond closely in wave-length to the coronal lines. During the past winter we have been making rather careful visual observations and find that some of the stronger of these lines belong to the swan spectrum of carbon, and are evidently due to some compound of carbon which is not completely absorbed by cocoanut charcoal at liquid air temperatures. These carbon lines are recorded in the literature as bands, but under the conditions under which we observe them appear to be sharp lines. We are adding to our equipment a quartz spectrograph for photographic observations and have under way a systematic fractionation of helium, using a number of methods, with the hope of eliminating the troublesome carbon compounds and of concentrating the unknown source of these remaining fainter lines sufficiently to enable them to be identified and thus prove or disprove the presence of coronium.

Hamilton P. Cady,
Howard McKee Elsey

University of Kansas,
Lawrence, Kansas

THE IOWA ACADEMY OF SCIENCE

The Iowa Academy of Science held its meetings in the Chemistry recitation room of the Science building of the State Teachers College at Cedar Falls, beginning at 1:30 P.M., Friday, April 25. After the preliminary business session and the general program section meetings were held. President Beyer gave his address on "Some problems in conservation" at the general meeting on Friday afternoon.

The following officers were elected for the coming year: *President*, T. C. Stephens, Morningside College, Sioux City. *First Vice-president*, Nicholas Knight, Cornell College, Mt. Vernon; *Second Vice-president*, D. W. Morehouse, Drake University, Des Moines; *Secretary*, James H. Lees, Iowa Geological Survey, Des Moines; *Treasurer*, A. O. Thomas, State University, Iowa City.

At 6:45 Friday evening a special war film was exhibited for the benefit of the academy and following this the evening was devoted to a résumé of the work of members of the academy during the war. President and Mrs. Seerley held a reception for the academy members after the meeting.

Sectional meetings were resumed Saturday morning and the business session closed the meetings. The members lunched together at 1:30 P.M.

The Iowa Section, Mathematical Association of America, held its fourth annual meeting Saturday forenoon, beginning at nine o'clock.

TITLES OF PAPERS

Zoology and Allied Subjects

A list of the birds found in Marshall county, II.: Ira N. Gabrielson.

The resistance of streptococci to germicidal agents: Henry Albert.

The correlation of art and science in the museum: Homer R. Dill.

Variations in the branches of the coelic artery in the rabbit: H. R. Werner.

An ecological survey of Dry Run, a small prairie stream. (1) The fishes: E. L. Palmer.

Animal tracks, food and disposition: is there any relation? E. L. Palmer.

Some zoological notes from the Barbadoes-Antigua expedition: C. C. Nutting.

Some interesting insect habitats in the tropics: Dayton Stoner.

Grasshopper control in Iowa: H. E. Jaques.

Some notes on the Cercopidae with descriptions of new species: E. D. Ball.

Thomisidæ of the Ames region: Ivan L. Ressler.

Notes on the occurrence of warts on cotton-tail rabbits in Iowa: J. E. Guthrie.

Medical work in the war: D. J. Glomset.

Variations in the branches of the carotid artery in the rabbit: Francis Marsh Baldwin.

Botany

Notes on the distribution of grasses of Iowa, Wisconsin, Minnesota and the Dakotas with reference to rust: L. H. Pammel.

Notes on the barberry: L. H. Pammel.

The genus Lactuca in Iowa: R. I. Cratty.

The rust on mammoth clover: W. H. Davis.

The moss and lichen flora of western Emmet county: B. O. Wolden.

The flora of Mitchell county: Mrs. Flora May Tuttle.

A naturalist's glimpse of the Limberlost: MRS. FLORA MAY TUTTLE.

Seed formation in Utricularia: ROBERT B. WYLIE and ALICE E. YOCOM.

Notes on new or rare Iowa trees: B. SHIMEK.

A discussion of certain rare species, chiefly of the genera *Quercus, Fraxinus* and *Carya.*

The genus Ceanothus in Iowa: B. SHIMEK.

A discussion of the species and varieties found in Iowa.

Rosa pratincola Greene in Iowa: MISS EVELYN ENSIGN.

A taxonomic and ecological discussion of the common prairie rose.

The fern flora of Nebraska: T. J. FITZPATRICK.

Gives a short sketch of the seven physiographic regions of Nebraska, noting the ferns found in each; eight reasons are formulated to account for the paucity of ferns in the state. The annotated list is based upon the material in the herbarium of the University of Nebraska.

Supplemental list of plants from southeastern Alaska: J. P. ANDERSON.

Measurements of wood fiber: HENRY S. CONARD and WILBUR A. THOMAS.

Check-list of the plants of Grinnell: HENRY S. CONARD and FRANK E. A. THONE.

Study of a section of the Oregon coast flora: MORTON E. PECK.

Hybridization in Iris: MISS M. LOUISE SAWYER.

Studies upon the absorption and germination of wheat treated with formaldehyde. (1) Dipping method: A. L. BAKKE and H. H. PLAGGE.

Chemistry

A chemical examination of some dolomites: NICHOLAS KNIGHT.

The analysis of a number of dolomites of the same geological formation, but from quite widely different localities, was made to compare the chemical composition. A specimen from Mount Vernon, Iowa, was chosen, and another from Lockport, New York, both belonging to the Niagara period of the Silurian age, and their composition was quite identical; also, another specimen from Westchester county, New York, resembling marble in physical aspects, belonging to the Cambro-Silurian, proved quite a typical dolomite, similar in composition to the others investigated.

The electromotive force and free energy of dilution of aqueous solutions of sodium bromide: H. B. HART and J. N. PEARCE.

Geology

Meteor mountain: DAVID H. BOOT.

The Aftonian gravels near Afton Junction—are they interglacial? GEORGE F. KAY.

Some large bowlders in Kansan drift in southern Iowa: GEORGE F. KAY.

A problem in municipal waterworks for a small city: JOHN L. TILTON.

New features with reference to the Thurman-Wilson fault: JOHN L. TILTON.

Note on conditions at the head of flood plains: JOHN L. TILTON.

Exhibition of pictures of the tornado which passed through Eastern Nebraska, April 6, 1919: JOHN L. TILTON.

The relation of the Satsop flora to the youngest known mountain range in North America: RALPH W. CHANEY.

Leaching, a factor in determining the age of glacial gravels: WALTER H. SCHOEWE.

The history of Boyer valley: JAMES H. LEES.

The Iowan-Wisconsin drift border: E. J. CABLE.

The deep well at Laurens and its interpretation: E. J. CABLE.

The effect of rivers on the location of Iowa cities: MISS ALISON E. AITCHISON.

An illustration of the wedge-work of roots: A. O. THOMAS.

A large granite boulder near Nashua, Iowa, is split by an elm tree fifty feet high growing in the cleft.

The ascent of Mt. Misery on the Island of St. Kitts, British West Indies: A. O. THOMAS.

Mt. Misery is an extinct, or at least a dormant, volcano. A day's stop at Basseterre permitted the writer and two other members of the University Barbadoes-Antigua expedition to climb the mountain. The setting of the mountain, the tree fern forest on its flanks, the crater, and the view from the summit are described.

A Herpetocrinus from the Silurian of Iowa: A. O. THOMAS.

Some remains of this remarkable genus of crinoids were recently collected at Monticello. Its structure, habits and geographic distribution in the Silurian rocks are discussed. This is believed to be the first reported occurrence of this crinoid from the Iowa Silurian.

The Independence shale near Brandon, Iowa: A. O. THOMAS.

Outcrops of this formation are rare. At two or three localities near Brandon, twelve to fifteen miles southwest of Calvin's original exposure,

occurs a bed several feet thick. It contains an abundance of the typical fossils.

Iowa's geological centenary: Charles Keyes.

That modern geology in America had its beginnings in Iowa appears to be not generally known. Before Thomas Nuttall's famous trip down the Mississippi River in 1809, and his extensive application of William Smith's principles of determining the relative age of rock terranes by means of their contained fossils American geology was distinctly Wernerian in aspect. The eminent German never had a stronger advocate than William McClure, president for many years of the American Philosophical Society, of Philadelphia. It was Iowa's particular mission to be the ground where the fossils were collected and the materials first critically compared with the organic remains of the mountain limestones of Derbyshire, England. There are a score or more important episodes in the history of American geology which first found light of day in Iowa.

Tertiary gravels of northern Utah: Charles Keyes.

The recent tracing of the Bozeman gravels of Montana over the crest of the Rockies into southern Idaho suggests their unbroken continuity farther to the south. They there seem to connect with the gravel beds exposed in the Red Rock Pass region and beyond in northern Utah, which have long remained a puzzle to all who have worked in that field. The fact that the gravels at the Pass appear to have been moving southward at the time of their deposition also has an important bearing upon the genesis and duration of the old Bonneville lake.

Louisian vs. Mississippian as a periodic title: Charles Keyes.

If we are to retain a geographic designation for the Early Carbonic rocks of America there is a valid term which has by a full decade priority over Mississippian. This is St. Louis, or, as we would call it in these enlightened days, Louisian. It is a name that was originally proposed for what was supposed to be the exact section covered by the Mountain Limestone as displayed in Derbyshire, England. Subsequent severe restriction of the name St. Louis to a single terrane and its wide use in this sense do not militate in the least against its first employment. A more satisfactory usage of the term Mississippian is as a serial title for a provincial succession, as recently proposed.

Possible errors in Pleistocene field-observations: B. Shimek.

A discussion of the value of root-tubules, calcareous content, fossils, etc., in determining the age of loess deposits; also certain dangers in the use of physiographic criteria in determining the age of Pleistocene deposits.

Helicina occulta Say: B. Shimek.

Additional notes on the distribution of this species. Both recent and fossil forms are discussed.

Physics and Psychology

Some structural features of selenium deposited by condensation from the vapor state above the melting point: L. E. Dodd.

The sublimation curve for selenium crystals of the hexagonal system: L. E. Dodd.

Superposed stroboscopic velocities: L. E. Dodd.

The relation between voltage and candle-power in modern incandescent lamps: Wm. Kunerth.

The action of conical horns: G. W. Stewart.

The binaural difference of phase effect: G. W. Stewart.

Some preliminary results on the photoelectric longwave length limit of the metals (platinum and silver): Otto Stuhlman, Jr.

A new non-inductive resistance: H. L. Dodge.

A new wall rheostat of large current capacity: H. L. Dodge.

The solar eclipse of June 8, 1918 (illustrated): D. W. Morehouse.

The effect of temperature in resistance and specific resistance of tellurium crystals: Arthur R. Fortsch.

Evaluation of mental tests as used in the army: C. E. Seashore.

The distribution of musical talent in the freshman class in the university: C. E. Seashore.

James H. Lees,
Secretary

SCIENCE

A Weekly Journal devoted to the Advancement of Science, publishing the official notices and proceedings of the American Association for the Advancement of Science

Published every Friday by

THE SCIENCE PRESS

LANCASTER, PA. GARRISON, N. Y.

NEW YORK, N. Y.

Entered in the post-office at Lancaster, Pa., as second class matter